Freescale Technology Forum

Collaboration. Innovation. Inspiration.

July, 2009

Introducing a New Modular Open Source Development Platform, Featuring Our Latest Serial-to-Ethernet V1 ColdFire® MCU and Complimentary Freescale MQX™ RTOS

Michael Norman

Systems & Enablement

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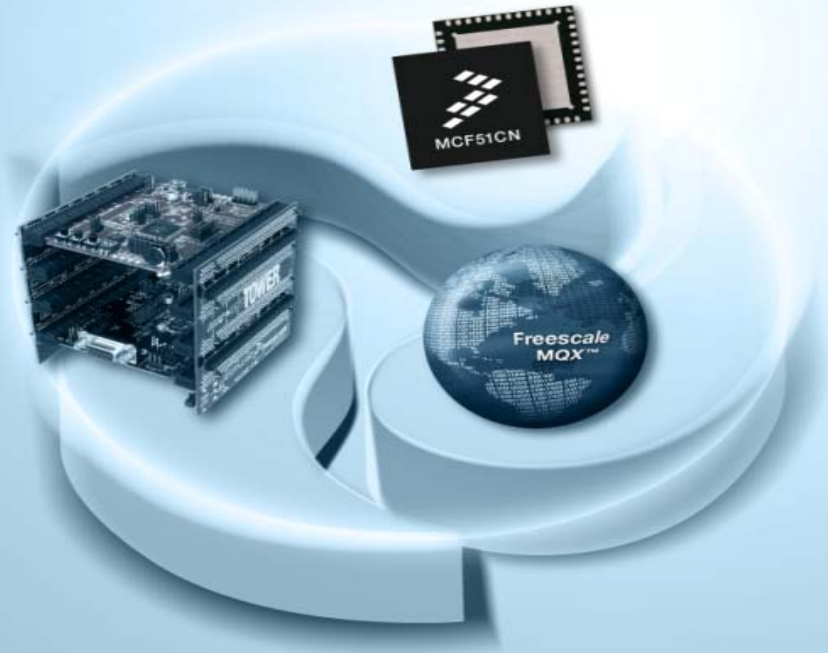

The Ultimate Ethernet Solution

ColdFire® MCF51CN Family + Freescale MQX™ Software +
Tower Development System

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The Complete Solution: Full Enablement Combined with MCF51CN

The Ultimate Ethernet Solution – ColdFire® V1 MCU featuring complimentary Freescale MQX™ Software with easy-to-use modular development hardware

Ethernet Connectivity Microcontrollers

- MCF51CN ColdFire V1 MCU featuring on-chip Ethernet and world-class tools to help enable Ethernet in your application quickly and easily.

Complimentary Freescale MQX RTOS

- With complimentary Freescale MQX™ Software, CodeWarrior and a world-class alliance network, the MCF51CN offers a comprehensive connectivity solution to help you develop quickly and easily.

Tower System

- Elevate your design to the next level. Our modular development platform saves you months of development time now and in the future through rapid prototyping and tool re-use.

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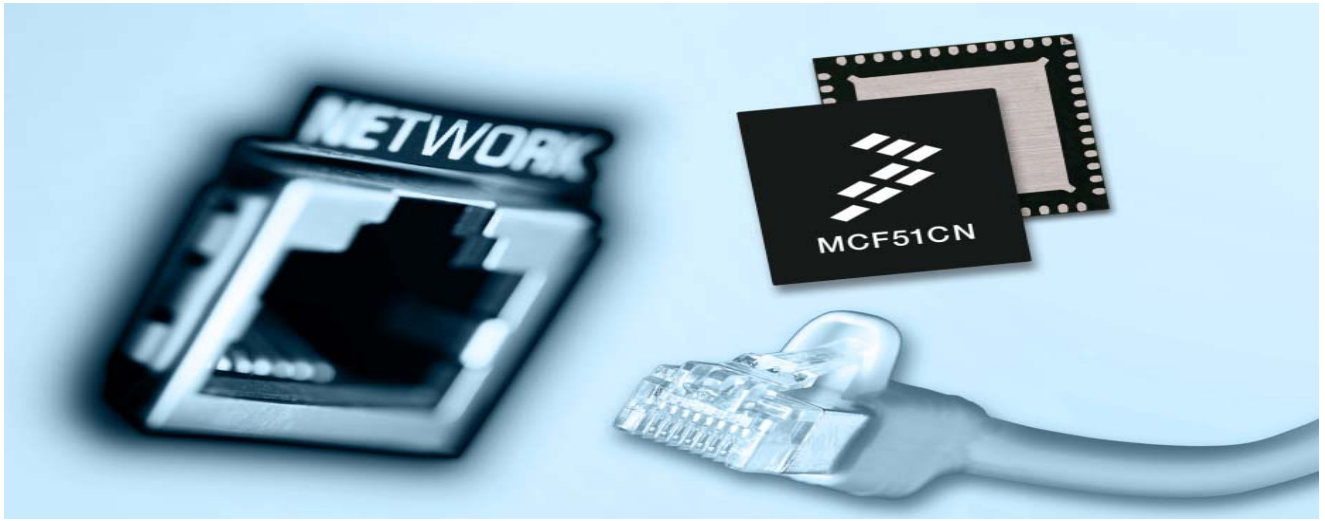
Ethernet Device Market Landscape



The MCF51CN family is ideal for customers who need to upgrade serial communication to Ethernet, as well as for new applications requiring 10/100Mb connectivity.

As serial ports are removed from PCs, many applications must switch from serial to Ethernet

Ethernet knowledge continues to lag behind the growing implementation of Ethernet

Ethernet also is being widely used for remote monitoring capability

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MCF51CN128

Core

ColdFire® V1 Core

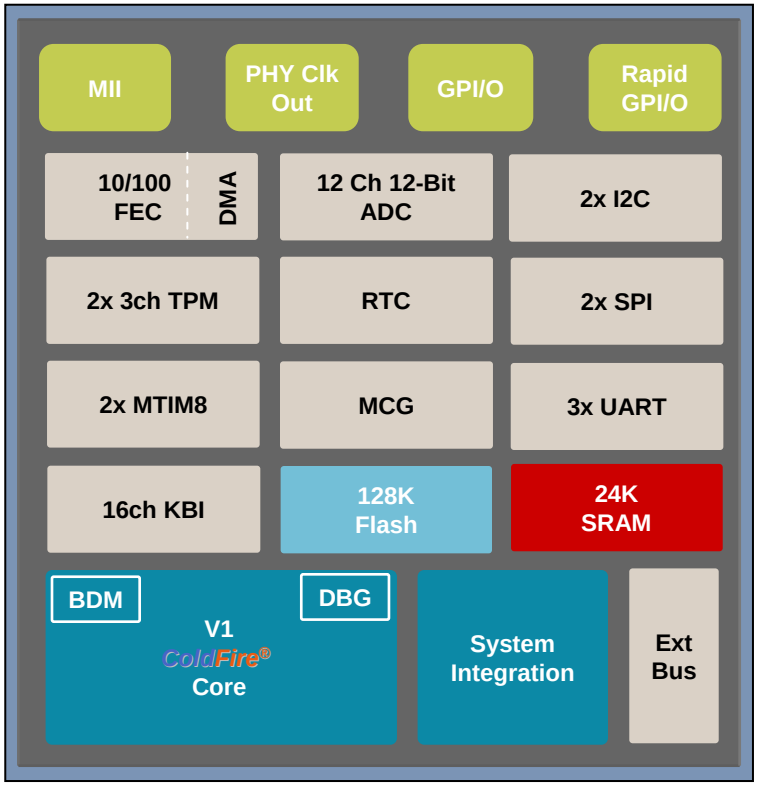
- Up to 46 Dhrystone 2.1 MIPS @ 50 MHz
- Mini-FlexBus support up to 2MB external memory

Memory

- 128K bytes flash
- 24K bytes SRAM

Features

- Ethernet:
  - 10/100 FEC – Fast Ethernet Controller with DMA
  - MII Interface with Output Clock for PHY
  - Support Half/Full Duplex
- Low power mode – Ethernet operation supported at 3V and above
- Ultra-small (7x7mm) 48-pin package
- 12-Ch, 12-Bit ADC
- 3x UARTs
- 2x SPI
- 2x I^2C bus interface
- Real Time Counter
- Up to 70 General-Purpose I/O
- System Integration (PLL, SW Watchdog)
- Single Voltage Supply 1.8-3.6V



Part #	Package	ADC Ch	KBI	Port I/O	Rapid GPIO	SCI (UART)	TPM Ch	Ext Bus lines addr/data/chip select
MCF51CN128CLK	80 LQFP	12	16	70	16	3	6	20 / 8 / 2
MCF51CN128CLH	64 LQFP	12	12	54	16	3	6	-
MCF51CN128CGT	48 QFN	12	6	38	8	3	6	-

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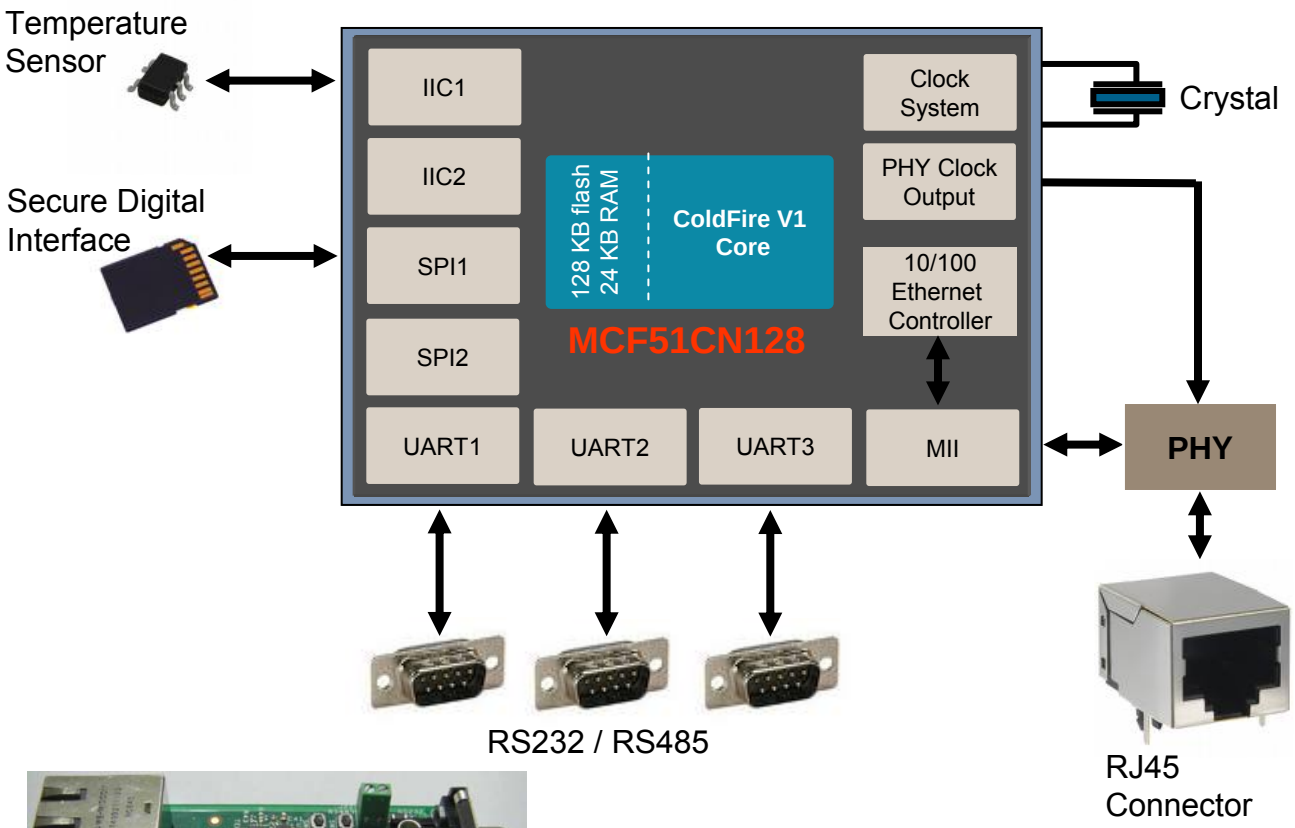
Serial to Ethernet Bridge



Serial to Ethernet bridge example

Key Benefits

- Connect traditional serial interfaces to any Ethernet network with multiple standard communication interfaces
- Suitable for applications requiring ultra-small footprints with 7x7mm^2 package
- Integrated PHY clock output helps eliminate additional PHY clock source and overall cost

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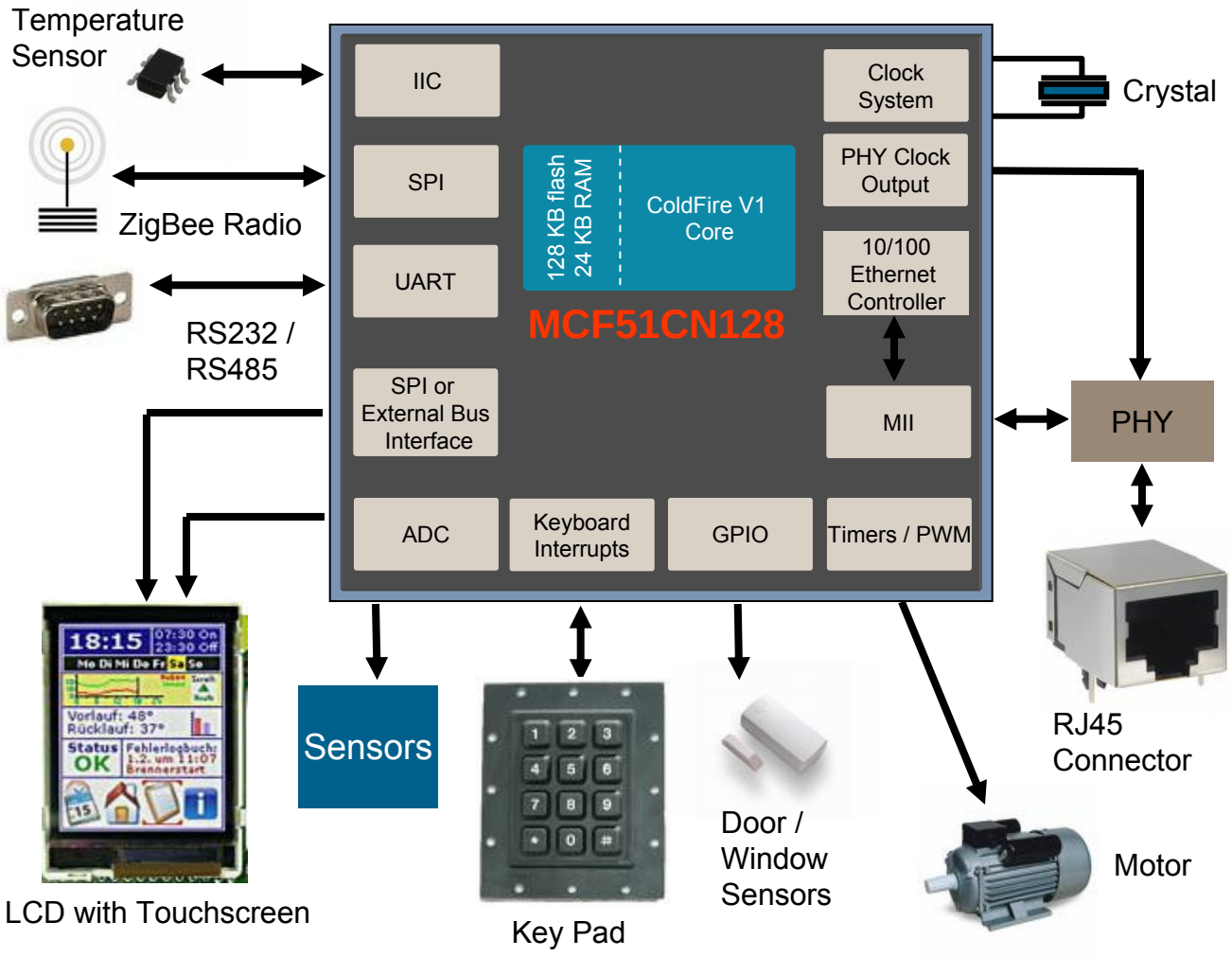
Building Access Control



Key Benefits

- Suitable for applications requiring remote monitoring and control via 10/100 Base-T Ethernet
- Integrated external bus interface for driving an LCD or memory expansion
- Multiple pulse width modulation timer channels for motor control

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MQX Software Solutions from Freescale

Enabling Embedded Systems – Accelerating Success

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Introducing Freescale MQX Software Solutions

Freescale accelerates success by embedding MQX with Freescale silicon to provide customers a full-featured, proven and scalable RTOS with connectivity software and is a complimentary offer.

Full-featured and Powerful

- Design with Freescale and expect one collaborative source for hardware, software, tools and services needs, providing a streamlined, powerful platform with MQX software solutions.

Proven and Valuable

- MQX is a market-proven software, made available on Freescale processors for over 15 years. MQX now comes included with Freescale silicon and is complimentary for the customer.

Simple and Scalable

- Freescale MQX software solutions offer a straight-forward API with a modular architecture making it simple to fine-tune custom applications and scalable to fit most requirements.

Freescale MQX
Enabling Embedded Systems – Accelerating Success

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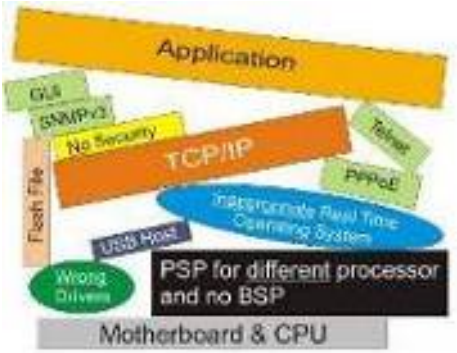
▶Freescale MQX Software Solution

Full Featured and Powerful: One collaborative source for hardware, software, tools and services needs

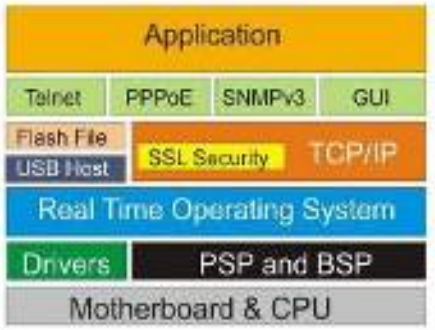
What is Freescale MQX?

- **RTOS (Full priority-based, pre-emptive scheduler)**
- **Real-time TCP/IP Communication Suite (RTCS)**
  - TCP/IP, FTP, Telnet, DHCP, SNMP etc..
- **USB Host -** HID, MASS, HUB
- **USB Device** - HID, MASS, CDC
- **MS-DOS File System (MFS)**
- **BSP I/O Driver: CAN, UART etc…**
- **HTTP Web server**

Past Customer Problem



The Solution



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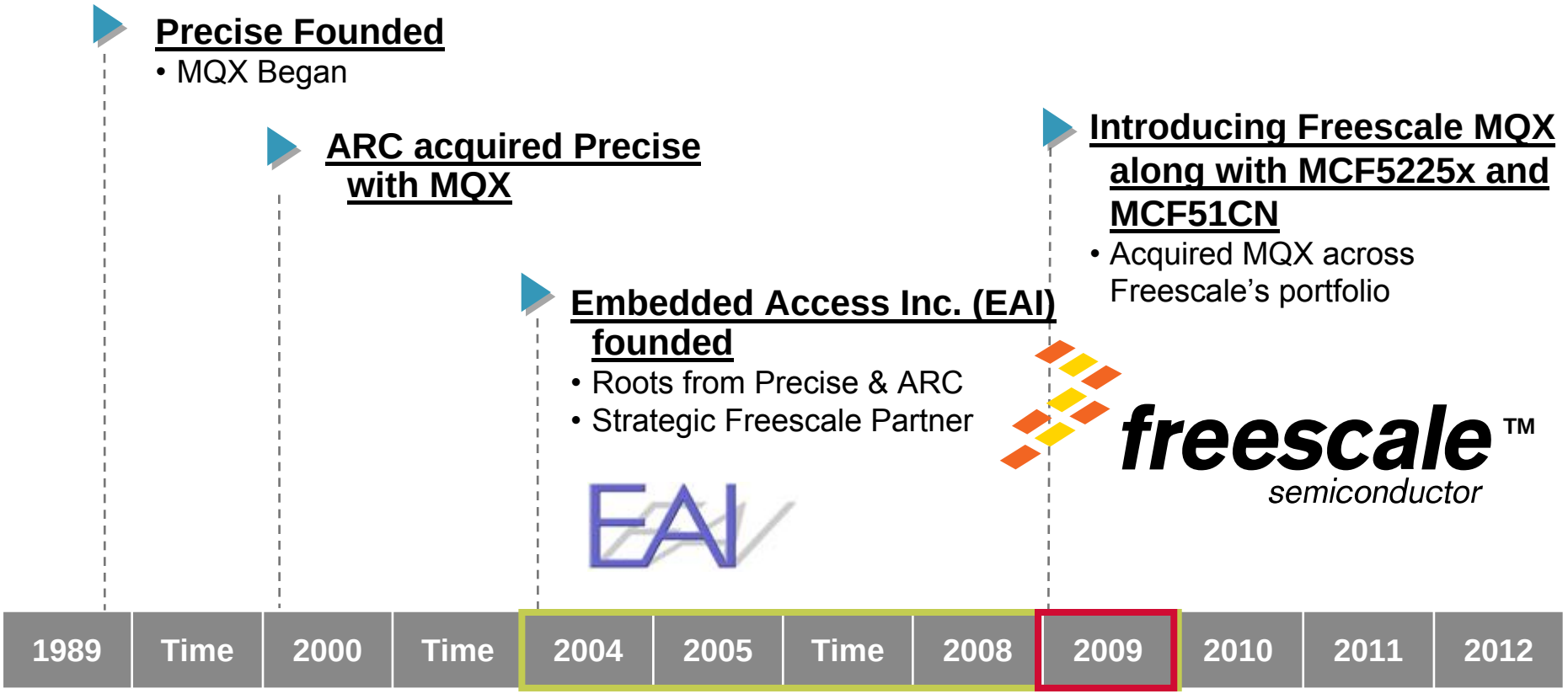
Freescale MQX Software Solution

Proven: Leveraging over 15 years in the market place, MQX has been providing powerful solutions with Freescale Processors



MQX: Used in over a million products

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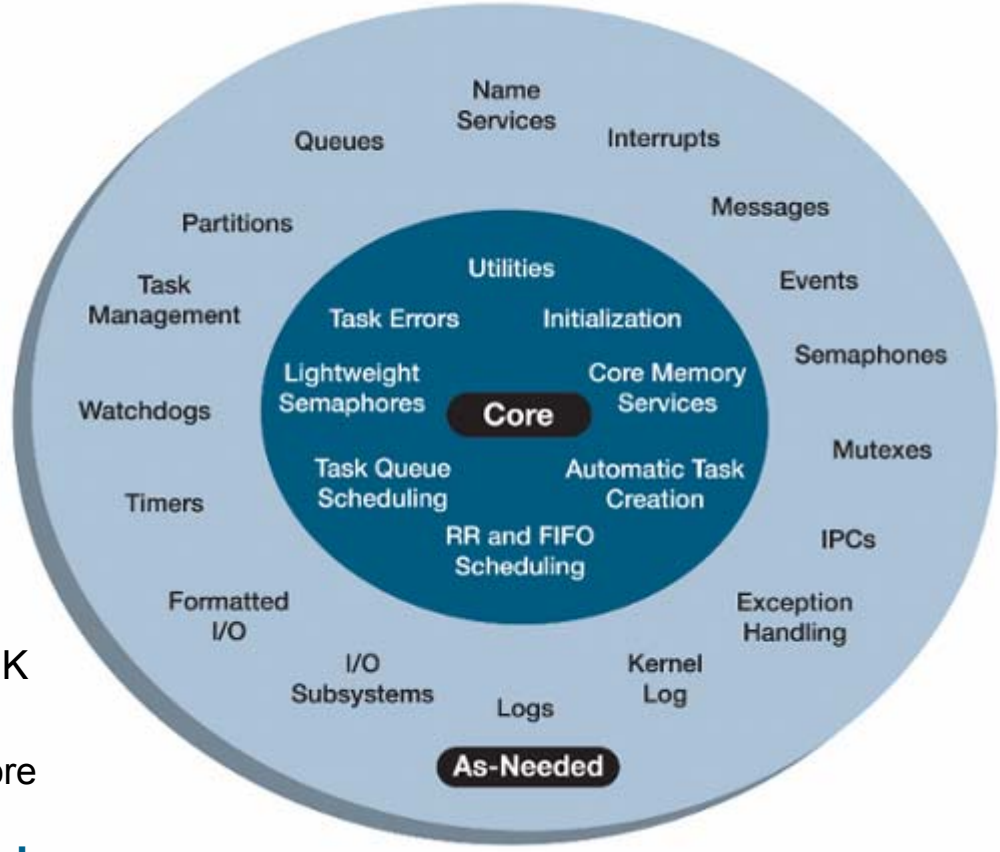
Freescale MQX Software Solution

Simple and Scalable: Straight- forward API and modular architecture can be fine-tuned to fit application requirements

- **Designed to be customized by**
  - Feature
  - Size
  - Speed
- **Lightweight services**
  - Smaller and faster vs. regular MQX services
  - Allows control of RAM/ROM utilization
- **Scalable Code Density ideal for MCU & MPU**
  - ROM size ranges from CFV2: 12K to 150K
  - RAM size starting at 2.5K
    - 2 task application with 1 LW Semaphore and minimum interrupt stack
- **New, custom components can be added**



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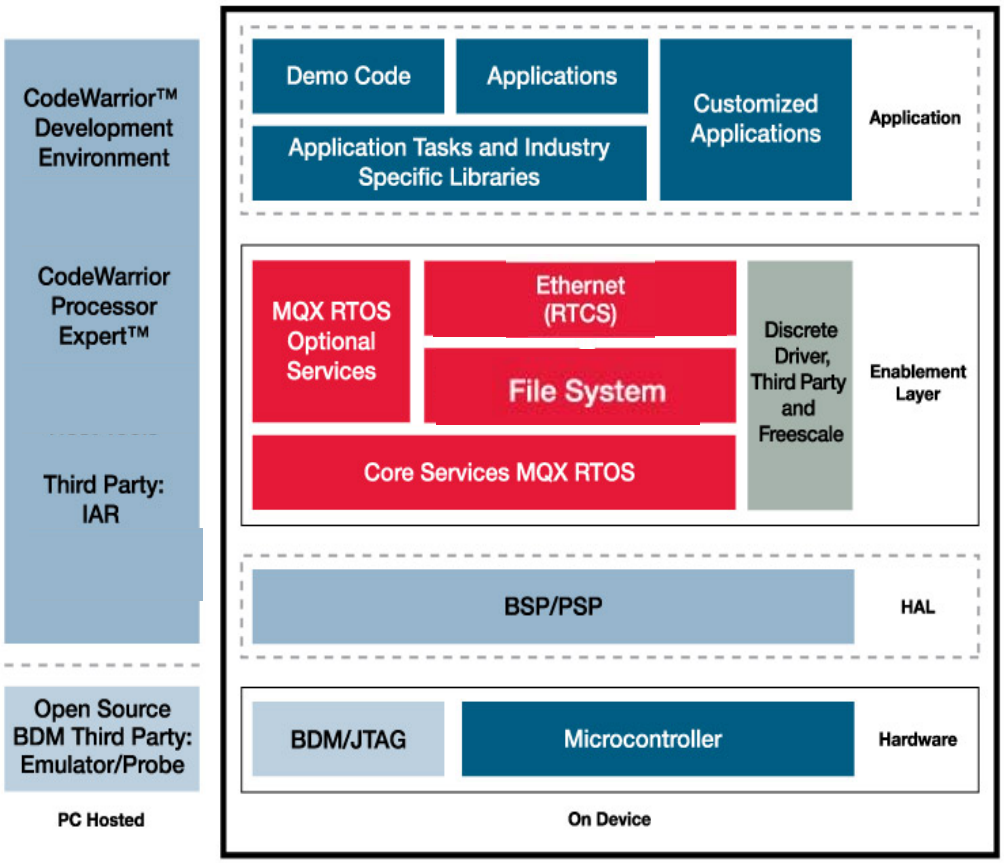
Complimentary Freescale MQX™ Software
Enabling Embedded Systems- Accelerating Success



►Offers complimentary Freescale MQX RTOS, communication suite (RTCS), file systems and more functions

►A single CodeWarrior development studio supports the entire ColdFire Family.

►Processor Expert allows GUI-enabled interface

►Cost effective development tools with built in BDM module for in-circuit debug

www.freescale.com/mqx

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Freescale Tower System

A Modular Development and Demonstration Platform

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Freescale Tower System

Elevate your design to the next level with the Freescale Tower System.
Our modular development platform saves you months of development time now and in the future through rapid prototyping and tool re-use.

Modular and expandable

- Developing with the Tower System is easy with modular, reconfigurable hardware.

Saves months of development time

- Open source design files and standard, reusable modules reduce low-level design—giving you more time to focus on differentiated solutions.

Low Cost

- Flexible modular design helps you control tool costs, from simple concept testing to full product development.

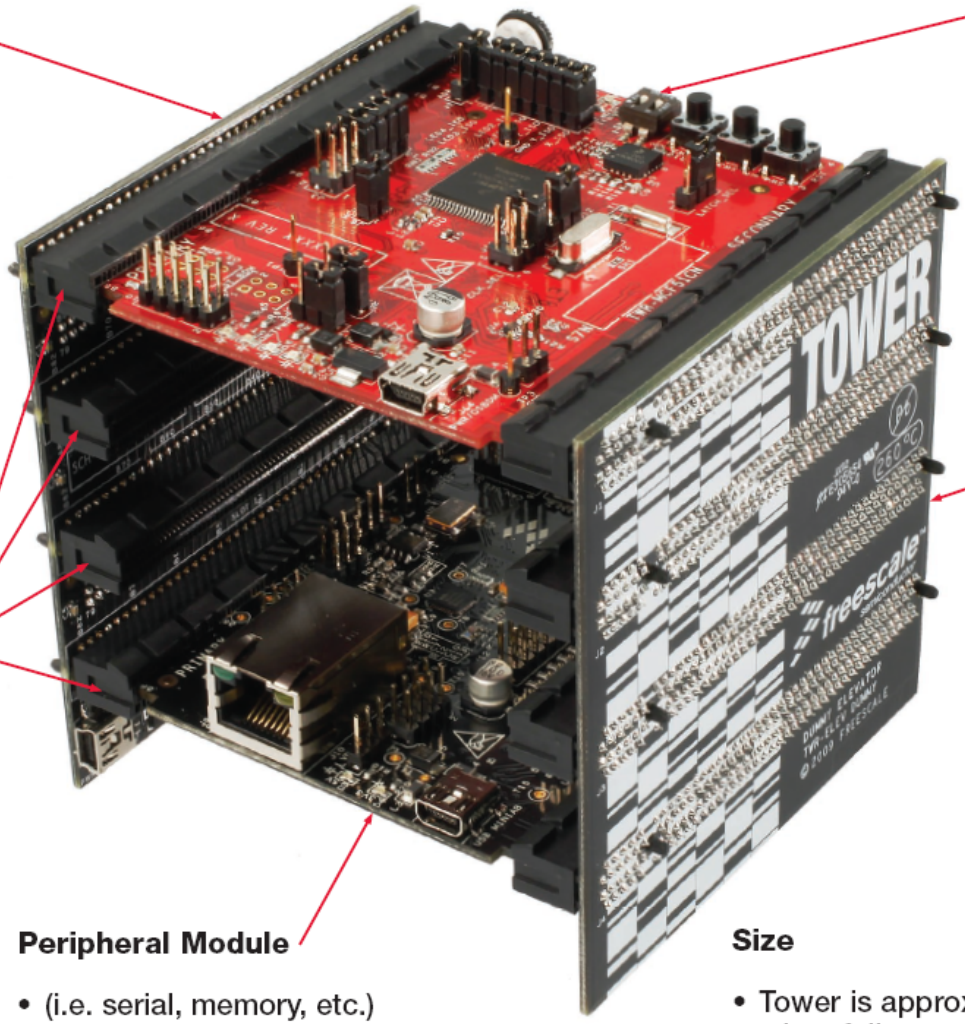
Tower System

Primary Elevator

- Common serial and expansion bus signals
- Two 2x80 connectors on backside for easy signal access and side-mounting board (i.e. LCD module)
- Power regulation circuitry
- Standardized signal assignments

Board Connectors

- Four card-edge connectors
- Uses PCI Express® connectors (x16, 90 mm/3.5" long, 164 pins)



Peripheral Module

- (i.e. serial, memory, etc.)

MCU/MPU Module

- Tower controller board
- Works stand-alone or in Tower System
- Features new open source BDM (OSBDM) for easy programming and debugging via mini-B USB cable

Secondary Elevator

- Future expansion for more serial interfaces and more complex MPU interfaces
- "Dummy" shown with only GND connectivity, also used for structural integrity

Size

- Tower is approx. 3.5" H x 3.5" W x 3.5" D when fully assembled

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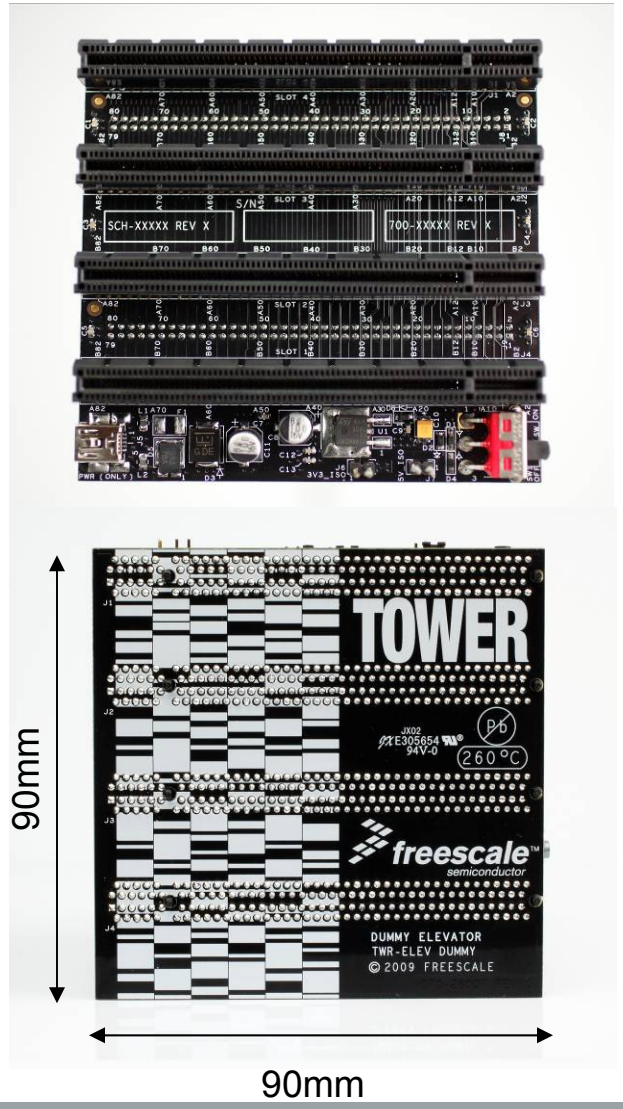
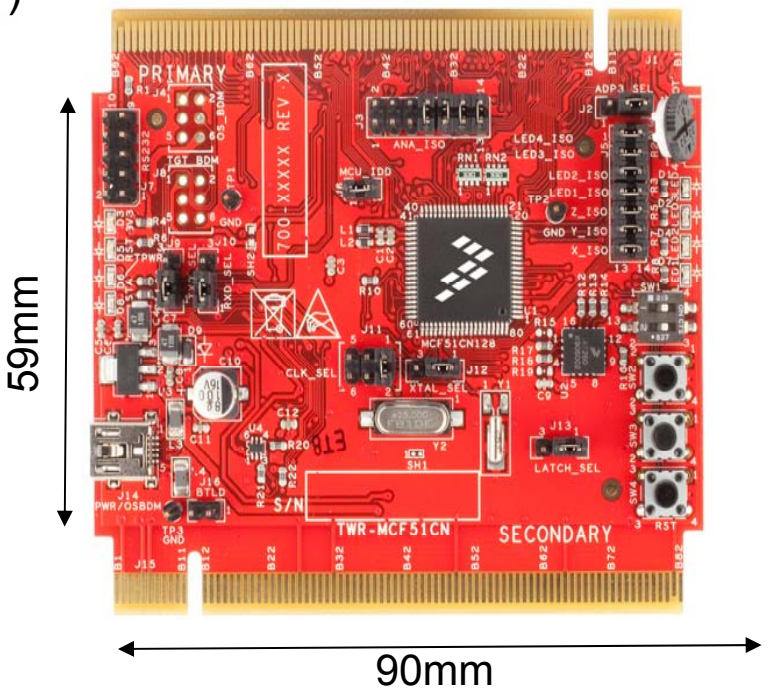
Elevator Modules

- Elevator Boards have high density, high performance, and low cost PCIe connectors
- An Elevator board can connect up to four modules.
- Defined set of digital and analog signals and power are supplied to all connectors.
- There are multiple power options with built in isolation:
  - 5V from miniB USB connector, regulated to 3.3V
  - 3.3V regulated by an MCU/MPU module
- Outward facing side provides:
  - access to all signals for probing, etc.
  - two expansion connectors for outward facing cards (e.g. LCD module)



Processor Module

- Primary connector carries most common MCU peripheral interface signals (e.g. SPI, SCI/UART, I2C, MII, USB, interrupts, (Mini-) Flexbus, GPIO/control signals)
- MCU/MPU modules are designed to work stand-alone as low-cost, entry level tools
- Features basic user interfaces (e.g. push buttons, DIP switches, LEDs, potentiometer, etc.) Features sensor or other useful demonstration circuitry (e.g. accelerometer)
- Debug interface via new OSBDM (on bottom side of board)
- Power and Debug through single USB connector
- Secondary connector defines more channels and additional peripheral interfaces such as LCD controllers and ULPI USB.



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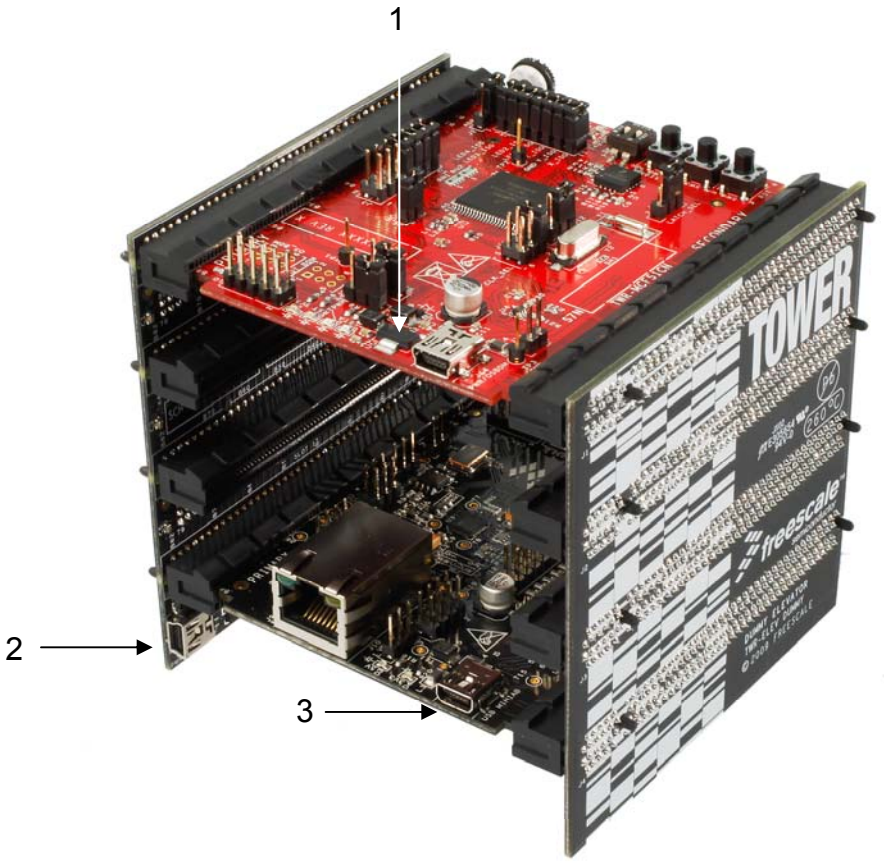
How to Power the Tower

Multiple Power Options

1. Processor Module via OSBDM
2. Tower Elevator
3. Peripheral Module

All power connectors are standard USB Mini-A or Mini-AB connectors that can be powered by a USB Host/Hub or an AC-to-DC adapter with a USB cable



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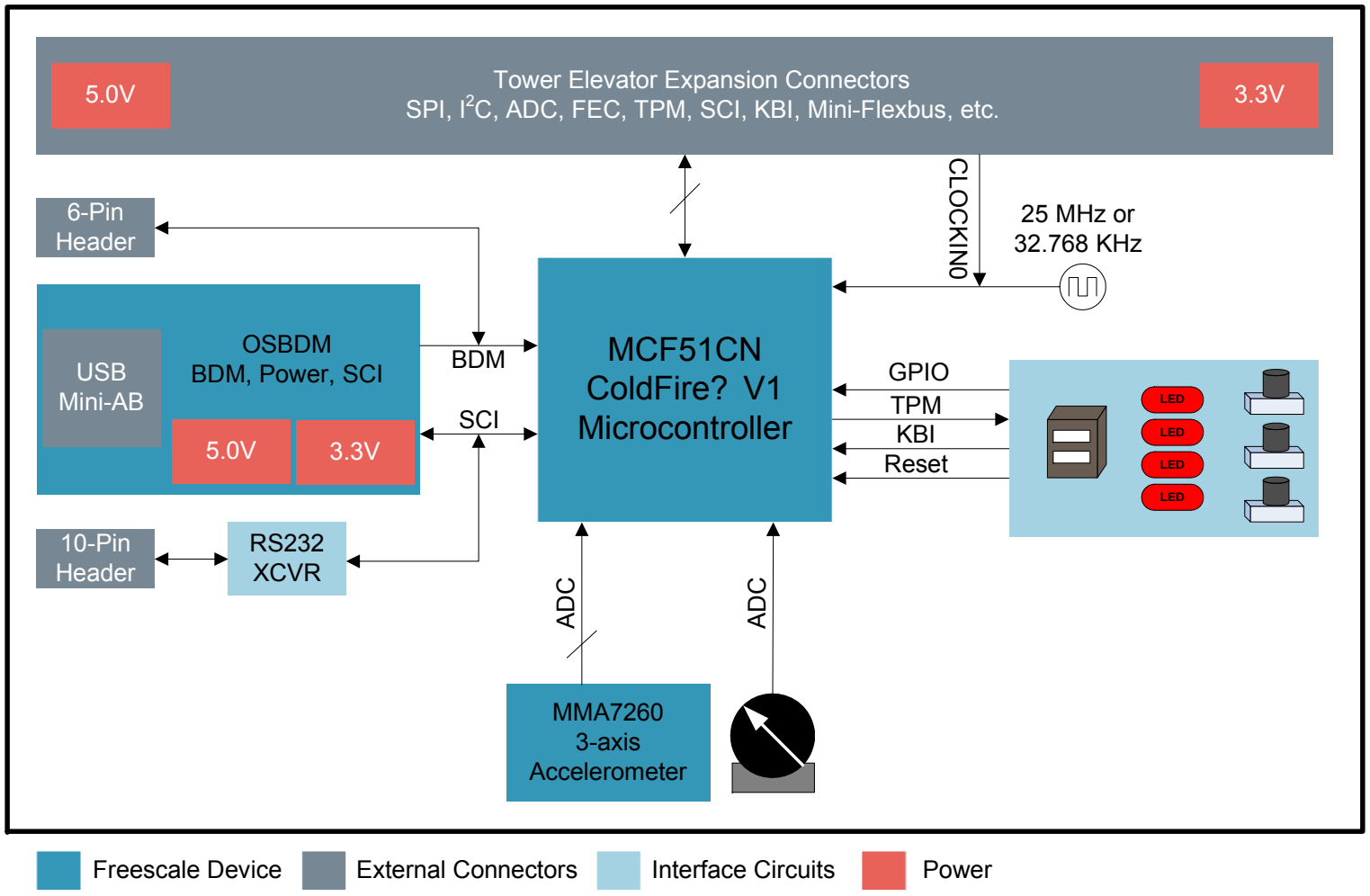
MCF51CN Module (TWR-MCF1CN)



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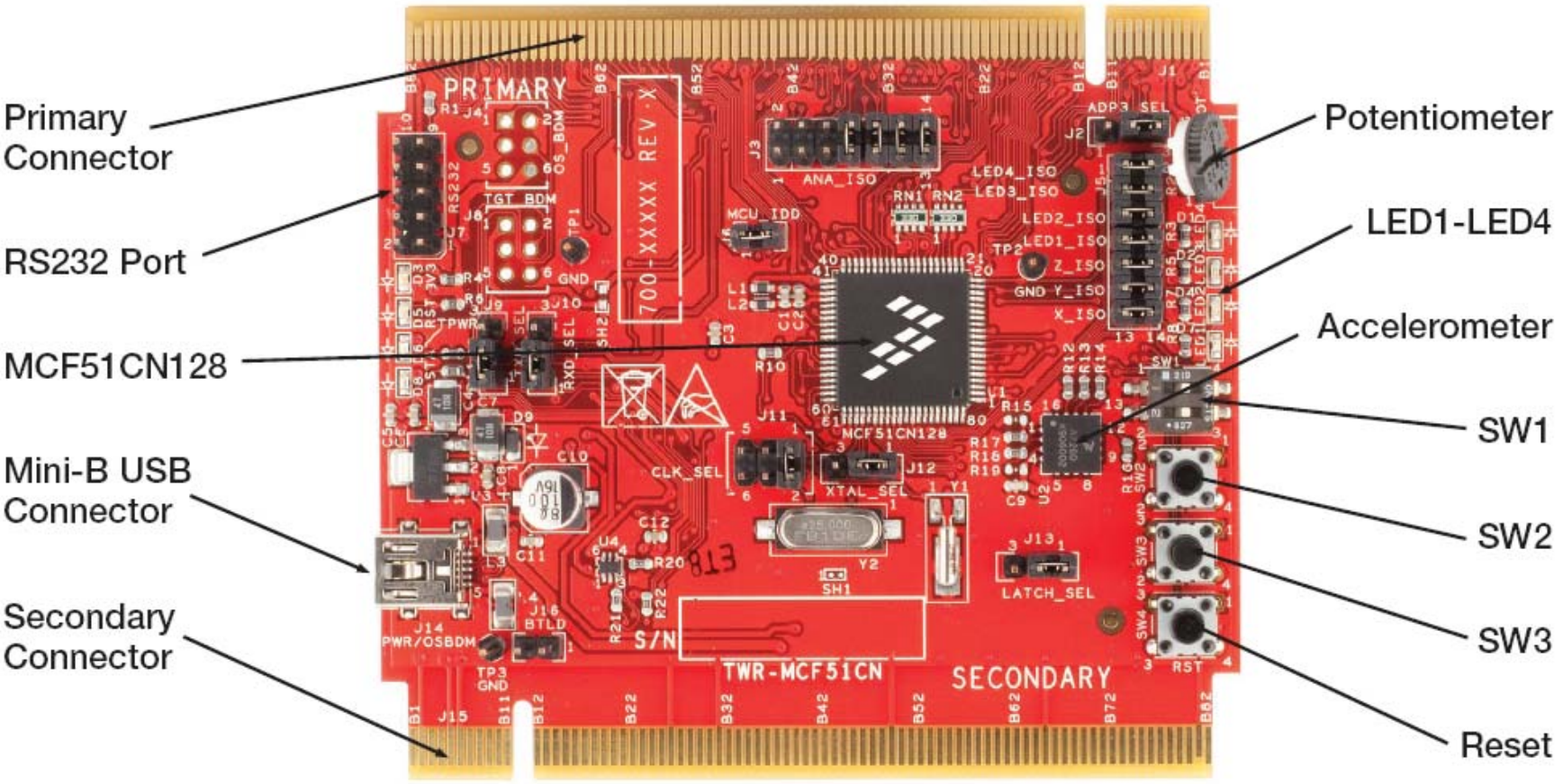
MCF51CN Module (TWR-MCF1CN)



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Peripheral Modules

First three peripheral modules already in design:

Serial Module	Memory Module	Graphical LCD Module
• RMII/MII Ethernet • USB Device, Host, and OTG • CAN • RS232/485	• Serial Flash • MRAM • SD Card (for memory and SDIO peripherals) • CompactFlash • Reprogrammable CPLD	• QVGA • Touch screen • SPI Interface • Memory/parallel bus interface • Audio Buzzer • Bidirectional Joystick

Future Tower Modules

Future Modules	Features
MCU/MPU modules	• Additional MCU/MPU modules featuring new 8-, 16-, or 32-bit devices with varying integrated features
Memory Module	• Secure Digital (SD) card interface for memory or SD input/output devices • Compact flash card interface • Complex programmable logic device (CPLD) • Magnetoresistive RAM (MRAM) • Serial flash
Graphical LCD Module	• 3.5" QVGA TFT display • Resistive touch screen • Serial, parallel, or RGB interface • Bi-directional joystick • Audio buzzer
802.11b WiFi Module	• Low power, serial interface WiFi radio board
802.15.4 Radio Module	• Serial interface 802.15.4 radio board
Segment LCD Module	• Outward facing board with segment LCD display
Audio Interface Module	• AC97 or I2S external codec board
Motor Control Module	• Circuits and connectors for driving motors
Capacitive Touch Module	• General purpose capacitive touch development board
Battery Pack Module	• Rechargeable Li-ion battery pack
Photovoltaic Energy-Harvesting Module	• Solar panel to harvest ambient sun light—Energy used to run Tower and charge a reserve
Telephony Module	• Telephony interface (FXO, FXS) for embedded voice applications
IrDA Module	• Simple UART interface to IrDA
Prototyping Module	• Protoboard, switches, pin headers, etc. needed for quick prototyping
FPGA Module	• High-end FPGA board with connection to all signals in tower

MCF51CN Development Modules and Kits

Complete Kits	ColdFire V1 Ethernet Kit
Part Number	TWR-MCF51CN-KIT
Contents of Kit (reference part # below)	• TWR-MCF51CN • TWR-SER • TWR-ELEV
Resale Price	$ 99.00

Individual Modules	ColdFire V1 Ethernet	Serial - Ethernet, USB, RS232/485, CAN	Elevator Boards
Part Number	TWR-MCF51CN	TWR-SER	TWR-ELEV
Contents of case	•MCF51CN module •1 USB cable •DVD •Lab sheet •Quick Start Guide	•Serial module •1 Ethernet Cable •1 USB Cable •User Manual (TWR-SER)	•Two elevator boards
Resale Price	$ 39.00	$ 49.00	$ 29.00

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Easy-to-Use Development Tools

- TWR-MCF51CN-KIT includes
  - TWR-MCF51CN & TWR-SER modules
  - TWR-ELEV modules & USB/Ethernet cables
  - Quick Start Guide, lab tutorials and user manual
  - Interactive DVD with documentation and training videos

- CodeWarrior Development Studio for Microcontrollers v6.2
  - New project wizard creates a working project in as few as seven mouse clicks
  - Advanced full-chip simulation enables hardware/software co-design
  - Processor Expert shrinks board bring-up from weeks to days with automatic code generation of initialization code and drivers
  - Free Special Edition with up to 32 KB code size [CWX-HXX-SE]

- Online training, webcast, technical documentation and application notes available at www.freescale.com/tower and www.freescale.com/coldfire

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Available Software and Tools Support for MCF51CN

Subset of a comprehensive ecosystem of partners

Run-Time Software: RTOS, Stacks, File System

SEGGER
µTasker
Micrium
Freescale MQX
Quadros Systems Inc.
expresslogic
freeRTOS
CMX SYSTEMS
IAR SYSTEMS Buy Direct

HQ Debugger/Emulators

PE micro
IAR SYSTEMS

Buy Direct

Cyclone MAX

Buy Direct

USB ColdFire Multilink :

IDE: Tools Compliers, Debuggers

CodeSourcery
IAR SYSTEMS
CodeWarrior

GNU Tools

Security

mocana

Medical

monebo

MQX Support/ Design Service

EAI

GUI Graphical

SWELL software
SEGGER

Flash Programming

AVNET
SYSTEM GENERAL

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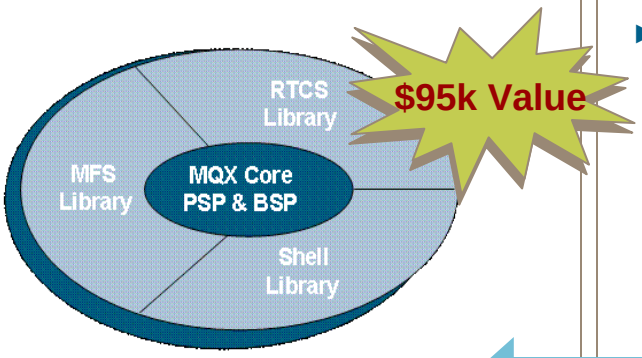
The Ultimate Ethernet Solution

Freescale MQX + MCF51CN

Complimentary Freescale MQX Software



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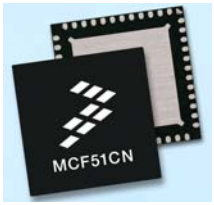


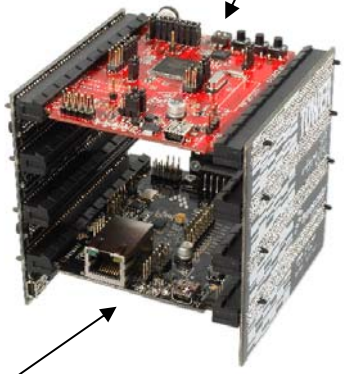
Starting at $2.99 USD

ColdFire V1 Ethernet MCU
Serial to Ethernet in Seconds

Tower System

- Modular and Expandable
- Low Cost

MCF51CN Microcontroller Module
$39 USD



Serial Module
$49 USD

Complete Kit $99 USD

Time to Market

Build a Tower Library

- Rapid prototyping
- Open source hardware
- Complimentary Freescale MQX

The Ultimate Ethernet Solution – ColdFire® V1 MCU featuring complimentary Freescale MQX™ Software with easy-to-use modular development hardware

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Related URL's

- www.freescale.com/tower
- www.towergeeks.org
- www.freescale.com/coldfire
- www.freescale.com/mqx

Related Session Resources

Sessions

Session ID	Title
AE130	Implementing Ethernet Connectivity with the Complimentary Freescale MQX™ RTOS
AZ146	Writing Your First Freescale MQX ™ Application - A Free, Proven and Full-featured RTOS - Accelerating Success

Demos

Pedestal ID	Demo Title
	Getting started with the TWR-MCF51CN-KIT
	MQX Home Security Telnet Demo - TWR-MCF51CN-KIT Lab 1
	MQX Home Security Email Demo - TWR-MCF51CN-KIT Lab 3

Q&A

- Thank you for attending this presentation. We'll now take a few moments for the audience's questions and then we'll begin the question and answer session.


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